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PORTLAND CEMENT'S NEW LABS — DESIGN & INDUSTRY —
CHARLES ELLET AWARD PAPER — 2nd PRIZE TECHNICAL PAPER
WSE MEETINGS, PAGE 2

Vol. 3 **OCTOBER, 1950** **No. 2**



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COVER CREDIT

Our October cover photo shows the wide expanse of the Portland Cement Association's new laboratories in Skokie, Illinois. W.S.E.'s tour of the plant and the construction details of cement building are discussed in the article "Construction Highlights—Portland Cement's New Laboratories," on Page 3.



October 2, Civil Defense

SPONSORED BY THE TRAFFIC ENGINEERING AND CITY PLANNING SECTION

Two experts on civilian defense will speak at WSE's Monday night meeting, October 2.

Colonel Baldwin B. Smith, Deputy Coordinator from the office of the Coordinator of Civil Defense will discuss the overall civil defense program and tell about the functions of the divisions of Civil Defense Organization.

Mr. Virgil E. Gunlock, chairman of the Traffic Planning Committee of the Engineering and Services Division of the Chicago Civil Defense Organization will point up the traffic planning phase of civil defense activities. The traffic problems created under an evacuation plan in an emergency will be included in his talk. Mr. Gunlock is Commissioner of Subways and Superhighways for the city of Chicago.

October 9, Railroad Power

SPONSORED BY THE TRANSPORTATION ENGINEERING SECTION

"Revolution in Railroad Motive Power" is the title of Mr. A. H. Candee's speech for the October 9 meeting.

Mr. Candee, transportation engineer, Westinghouse Electric Corp., will cover all the various experimental types of power now under study and development. Mr. Candee graduated from Yale University and received his PhB. degree from Scheffield Scientific School.

October 16, Automatic Transmissions

SPONSORED BY MECHANICAL ENGINEERING SECTION

"Automatic Transmission for Automotive Use" will be the subject of the talk at W.S.E.'s regular Monday night meeting, October 16. R. J. Gorsky, design engineer of the Transmission division, Buick Motors, will trace the history of automotive transmissions from the first crude invention to the present automatic drive.

Mr. Gorsky, who is assigned to Dynaflow at the Buick plant, will use slides in his presentation, and a cut-away Dynaflow transmission assembly will be on display.

Gorsky graduated from General Motors Institute in 1935 and entered the Buick Engineering department. After two years of general engineering experience he was transferred to Transmission and concentrated on the development of the automatic drive.

October 23, Annual Fall Dinner

Col. John Slezak will speak at W.S.E.'s annual fall dinner at the Furniture Club. Details and reservation blank are printed in this issue.

October 30, City Planning

SPONSORED BY THE HYDRAULIC, SANITARY AND MUNICIPAL ENGINEERING SECTION

"Decentralization of Industry and Population" will be the theme of the October 30 meeting.

Mr. F. J. Osborn, the noted British city planner will tell how his experiences in England apply to a city like Chicago. Mr. Osborn is touring the country under the sponsorship of the American Institute of Planners.

The British planner is best known for the founding and managing of the Welwyn Garden City outside of London. Mr. Osborn is also the author of several books on city planning.

November 1, Seminar on Profits

SPONSORED BY THE JUNIOR DIVISION

The Junior Division of W.S.E. will discuss "Profits and Survival" in a series of four seminars starting November 1, at 7:30 p.m.

These meetings are designed to acquaint younger engineers with the all-important financial side of business which is not often covered in the engineers' formal training. The meetings will be round-table discussions with group participation.

Daniel K. Chinlund, Commercial Personnel Supervisor of the Illinois Bell Telephone Co. will moderate the seminars. Mr. Chinlund received his Master of Science degree in Business and Engineering Administration from MIT last June. He completed his studies at MIT under the Sloan Fellowship Program for Executive Development.

The subject of the November meeting will be "What Are Profits?" One discussion each month will be held at W.S.E. headquarters.

November 4, Excursion

An excursion trip by train through the Chicago industrial area is planned for November 4. The special train leaves the La Salle Street station at 9:30 a.m., and returns at 4 p.m. Excursion costs per person will be between $1.50 and $2.00 depending on the attendance.

Make your reservations immediately with Mrs. Frasca at the W.S.E. office, 84 E. Randolph St., phone Ra 6-1736.

Some of the events to be viewed are the Great Retarder switching yards near Hammond, the Stock Yards, Diesel engine repair shops, the steel district and many types of manufacturing installations.

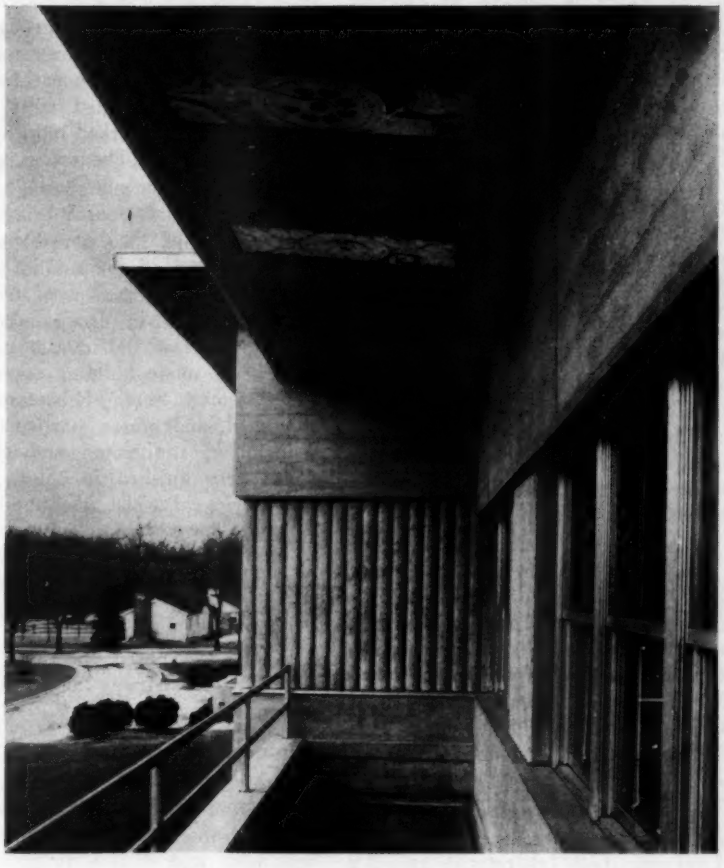
Gondola cars will be attached for camera fans and open air observers if the reservations are sufficiently large. Luncheon will be served by W.S.E.'s caterer at a small charge.

Not only because this excursion will prove definitely educational and different, but because this is a complimentary gesture by these railroads to W.S.E. engineers, you are urged to make the trip. Make your reservations early.

Construction

Highlights

Portland Cement's New Labs



On September 16, W.S.E. toured the Portland Cement Association's new research laboratories, its first excursion of 1950-51. Approximately 100 members and guests gleaned an insight into tomorrow's developments in cement. After a preliminary talk by officials of the Association, the members split up into smaller groups and inspected the laboratories' great testing apparatus and atmosphere rooms. Here is just a glimpse of what they saw.

— — — — —

Across the country, a team of scientists and structural engineers are pressing their investigations of pre-stressed concrete in terms of new standards for economy, usefulness and beauty in many types of concrete construction. The new research and development laboratories of the Portland Cement Association will be a principal center for these studies.

Portland Cement Association's new laboratories are the largest and most completely equipped in the world devoted exclusively to research on cement and concrete.

The laboratory group consists of two architectural concrete buildings joined by a covered walkway, and provides about 98,000 square feet of usable floor space. They were built to replace and approximately triple the Association's former research facilities located at its general headquarters in Chicago.

In Skokie, Illinois

The two laboratory buildings are located in Skokie, Illinois, 16 miles northwest of Chicago's loop. The main building contains about 80,000 square feet of floor space, is two stories tall with a penthouse and basement. Second in the group is the auxiliary laboratory building containing 18,000 square feet of usable floor space and is only one story without basement.

Designed to house the offices and laboratories, the main building shelters the labs' various temperature, humidity, chemical and physical testing rooms. Conference and reading room, a library, cafeteria, drafting room and clerical spaces are also located in this main building along with various maintenance and service areas.

Purposes of the auxiliary building are to provide space for storage and for processing operations, some of which require high temperatures and relatively heavy or dust-raising industrial machinery. It is equipped with overhead cranes and has dust collecting equipment on its roof.

There are more than 30 specialized laboratories, testing and curing rooms in the two buildings. In some of these spaces condition of arctic cold, desert dryness and tropic heat are duplicated, with temperatures ranging from 20 degrees below zero, Fahrenheit, to 130 degrees Fahrenheit. Relative humidity can vary from 15 to 100 percent. Equipment ranges from the very delicate and highly complex, to powerful testing machines,

(*Continued on Page* 4)

Portland Cement's New Labs

(*Continued from Page* 3)

one of which is capable of exerting 1,000,000 pounds of pressure on concrete specimens up to 30 feet long, 15 feet high and 10 feet wide. See picture on this page.

E-shaped Building

In overall plan, the main building is an E-shaped structure with wings to the rear, and connected. The central wing is enlarged at the rear to accommodate the 1,000,000 pound compression testing machine and the overhead crane necessary for handling its large specimens. This central wing is connected to the east wing at first and second floor levels, and to the west wing at the second floor level. The two interior courts formed by these connections, one enclosed and one partially enclosed, are landscaped.

Protected by a concrete slab canopy, a walkway connects the west wing of the main laboratory building with the auxiliary laboratory in the rear. The auxiliary building is a rectangular 102x180 feet. The central part of this structure houses the industrial processes laboratory, and has a two-story ceiling. The remainder of the building is only one story.

By taking full advantage of the decorative as well as structural qualities of concrete, both laboratories gained a clean-lined appearance.

Reeded architectural concrete piers separate the large window openings. In the main building these piers are 8 inches thick and were cast in plaster waste molds. Set back 3 inches from 11-inch thick exterior walls and spandrel beams, they produce sharp horizontal lines. These lines are emphasized by natural shadows, and are broken only by the large vertical mass of the central portion of the structure.

Further architectural interest is provided the main building by precast concrete ornamental panels set into the soffits of over-hanging roof canopies, and into the side walls of the east and west wings. (Picture on page 3). Nearly all exposed metal work is aluminum, including canopy nosings and trim, windows, window assemblies, screens, sash and railings.

Pleasing texture and color was obtained on exterior concrete walls by use of center-matched Oregon fir form boards, and by means of a grout clean-down. The form boards left distinctive grain markings and a texture that is neither too smooth nor too rough. The grout used in the clean-down contained some white portland cement for light color, and was applied with a stiff bristle brush and worked into the voids with a cork float. The excess was removed by rubbing with burlap, so that there is no film sheen.

Interior walls have several finishes. Nearly all walls in the auxiliary building and in the basement of the main building are cast-in-place concrete, left exposed. Most of the interior partition walls in the main building are of concrete masonry. Some of these were left unpainted, and others, particularly office, lobby, auditorium and corridor walls, were finished in colors. Those laboratories in which the humidity is controlled have their walls covered with a bituminous seal coat and two coats of aluminum asphalt base paint. The walls of the kitchen and moist rooms are finished with portland cement plaster. Cast stone was used effectively in the lobby, front stairway and toilet and shower rooms.

Engineering Features

Both structures are wall bearing. The engineering design is one-way and two-way slab-to-girder, with the girders kept wide and shallow to give ample headroom, good ceiling effect and free run to ventilating ducts. The auxiliary building was designed for spread footings; the main building for concrete piles.

In construction of the main building, a total of 530 piles with an (average length of 35 ft.) were driven. Twenty-seven piles were required to support the 262 cu. yd. articulated concrete base for the 1,000,000 lb. compression testing machine.

A total of 502 tons of improved deformed bars complying with current ASTM specifications was used. Typical wall steel for the buildings consists of two rows of ½-inch round bars on 12-inch centers in both directions. Temperature steel in slabs consists of ½-inch round bars on 12-inch centers at right angles to the main steel. Slab reinforcing steel was usually supported by chairs, except where the appearance of the underside was important, as in the entrance canopy. In such cases it was supported from above.



An arbitrary rule was set up to provide control joints at least every 22 feet in all walls. In most instances they occur at shorter intervals. On exterior walls, rustication lines were provided for this purpose, as well as for decorative effect, and to permit use of form panels which could be moved manually. The vertical rustication lines were spaced to permit the forming between panels of continuous control joints from bottom to top of the structure. The horizontal rustication lines were spaced so that the panels could be moved from lower to higher lifts and reused after only slight alterations in height were made.

The height of form panels varied from 6 to 10 ft., and the width from 8 to 16 ft. In their construction 1 x 8 inch center-matched Oregon fir boards were nailed to 2 x 4 inch vertical studs on 16 in. centers. The use of center-matched boards enabled the form carpenters to select the better side for the face of the forms, and in some instances to reverse the boards in the forms for longer use. To permit easier stripping of the forms, to reduce shrinkage and prolong the life of the boards, all form lumber was dipped in emulsified stearate before use. Before reuse, the forms were cleaned and again coated by means of rags or brushes dipped in the stearate.

In interior walls in the main building, control joints were placed at the sides of columns which occurred approxi-

(*Continued on Page* 5)

Portland Cement's New Labs

(*Continued from Page* 4)

mately every 20 ft., so as to separate the columns from the walls. Block facing was anchored to the columns to bring them flush with the adjoining masonry walls.

An interesting practice was the use of ceiling anchorages to give lateral stability to concrete masonry walls. A series of 2½ x 1-inch 14 gauge steel angles were fastened to ceiling by means of a nail type anchor set by a powder-driven fastening tool.

Columns and Piers

The wall bearing design of the buildings called for placing spandrel beams integrally with floor slabs. Realizing that the intersecting of deck and spandrel steel would make it all but impossible to place concrete of a stiff consistency in the piers and interior columns below, all interior columns and piers were placed before deck and spandrel steel was set. This practice, in addition to facilitating placing operations, eliminated the tedious job of cleaning around deck reinforcing steel, as it was not yet assembled when the concrete was being delivered to pier and column forms.

All interior columns are square or rectangular, and were formed with ¾-inch plywood. There are, in addition, six exterior round columns. Three support the general analytical chemistry laboratory and corridor between the west and central wings of the main building, and three support the concrete slab canopy connecting the main and auxiliary buildings. The columns supporting the general analytical chemistry laboratory and corridor were cast in conventional steel forms, but the three supporting the slab canopy were cast in paper tubes. These paper tubes were strong and rigid enough to permit the casting of 16 ft. columns without lateral bracing, and gave a pleasant finish.

Radiant Heat in Aggregate Processing Room

Floor slabs of working areas in both buildings have a concrete topping containing traprock coarse aggregate. In the auxiliary building where the floors were placed in one course, traprock screenings were spread on the surface and worked in with power floats. In the main laboratory building, where two course floors were used throughout, the procedure was different. A cement-sand grout was first spread, then traprock concrete of thick consistency applied. It was tamped, rolled by hand and power floated to an even surface, approximately 1 inch thick, then finished with troweling machines. It produced 12,000 lbs. concrete in 28 days.

In corridors and most executive offices, the concrete slab is covered with asphalt tile. In the lobby and rest rooms, floors are terrazzo.

Hot water coils for radiant heating are built into the floor in the aggregate processing room of the auxiliary building. It also has overhead convectors. This enables aggregates to be dried while in storage, with consequent savings in processing time. The radiant heating pipes are wrought iron, ¾ inch on 12-inch centers. Three units of these pipes, each supplied by a 1 inch wrought iron hot water feeder, rest on a 6 inch thick crushed limestone fill, and are covered by a 6 inch concrete floor slab. The aggregate processing room is the only room in either of the two buildings equipped with radiant heating.

No Unusual Demands on Contractor

While the Association assigned inspectors to supervise all mixing and placing operation and to control the quality of the concrete, no unusual demands were made on the contractor. Materials were chosen from those in the Chicago area with a good service record, which would produce a concrete light in color. All brands of portland cement shipped into the Chicago area were used. A standard of quality was maintained which could be duplicated on any job in the field.

Expect Shortage of Engineers, Dr. Grinter, of I. I. T. and W. S. E.

There will be a shortage of engineering graduates in the United States before present high school seniors can complete four-year courses in engineering.

This prediction was made by Dr. L. E. Grinter, professor of civil engineering and mechanics and former vice president of Illinois Institute of Technology. Dr. Grinter is the recently selected chairman of W.S.E.'s Bridge and Structural Engineering Section.

"High school graduates are completely mistaken in fearing that the temporary slight excess of engineering graduates will crowd the profession four years from now," he reassured prospective engineers.

Estimating the current, 1950, engineering graduates to number 45,000, he forecast a sharp reduction next year and in 1952.

"Because of the small birth rate in the early '30's, the present pool of high school students is rapidly becoming smaller than in pre-war years. And a smaller percentage are choosing engineering as a career."

"It is clear," he continued, "that the number of engineering graduates by 1954 will be smaller than in 1940. But the job opportunities for graduates in 1954 are expected to double those of 1940."

Dr. Grinter noted that one state university has only 300 freshmen in its present total engineering enrollment of 2,200, and an even smaller freshman class is expected next fall.

There is misunderstanding, too, he said, as to the purpose of an engineering education.

"It has a dual purpose. It serves first as professional education for future engineers, but it also furnishes to large numbers of young men the best education available for living and earning in a technological world.

"Thousands of engineering students will become industrial salesmen, supervisors, managers, and representatives of corporations, for which their education as engineers is more valuable than education of a more general character."

"Not even one-third of all engineering graduates remain in professional engineering over an entire lifetime," concluded Dr. Grinter.

Mechanical Accounting For
First Prize — Charles Ellet Award

BY DONALD KLUSMAN, PLANT EXTENSION ENGINEER, ILLINOIS BELL TELEPHONE CO.

Automatic telephone communications equipment is rapidly approaching the point in design that will enable a subscriber to pick up his phone and mechanically select any desired number in the country. While it will be quite some time before this service is available to large numbers of subscribers, it appears that the basic design problems will be resolved in the near future. Already it is possible for many operators to call directly by mechanical means thousands of telephones located all over the country.

An all-important step in the direction of this goal is the introduction of a mechanical accounting system that records and produces billing information on metropolitan area dialed calls with uncanny precision. This new addition to the Bell family is called Automatic Message Accounting, AMA for short. It has been placed in service in Pennsylvania, New Jersey and Michigan. Service in the Chicago metropolitan area is expected shortly.

Information is Recorded on Tape

The process is like this: when a subscriber dials a chargeable call, a paper tape in his local central office is perforated in a coded pattern according to the details of the call placed. Later, this tape is taken to an "accounting center" for processing. The finished products are printed records giving an accounting of the calls by directory number; these records are then used in preparing monthly bills.

There are various classes of telephone service that must be identified by this AMA equipment. Only calls from one and two-party noncoin, and PBX lines can be handled. No facilities are provided at present to charge traffic on either four-party or rural lines because of subscriber identification problems presented here. This of course means that these subscribers are not able to dial over extended dialing areas. Consideration is being given to arrangements for handling traffic for these types on a customer-dialed basis in the future.

If a subscriber with flat-rate service makes a local call, no record of the call is required because he is allowed an unlimited number of calls. If he calls a more distant point in his metropolitan area, it must be determined whether or not detailed toll billing is required. If a subscriber has message unit service, he must be billed for the appropriate number of message units used. All of this, the AMA equipment can record from the following information:

1. *Calling subscriber's directory nummer*—This code consists of the numerical portion of the subscriber's listing plus one digit identifying the central office out of which he calls.
2. *Called number*—This number is obtained from the central office dial equipment used to complete the connection.
3. *Called number structure*—It is possible that the numerical portion of the called number consists of either three digits, four digits with or without a party suffix, or five digits as in numbers over 10,000. The proper code is perforated on the tape.
4. *Numbering area code*—The entire country is tentatively divided into about 80 numbering areas for ultimate nationwide intertoll dialing.
5. *Message billing index*—This index code designates the charging treatment to be applied and whether the message is to be bulk-billed in message units or detail-billed by messages. There are several formulae for converting chargeable minutes into message units depending on local tariff. Each formula gets an arbitrary identification number, which is part of the message billing index.

   Bulk-billing means that the charges on such calls are computed in terms of message units. The customer is charged for the number of message units he uses. Detailed-billing indicates that the subscribers will receive itemized list showing the date, called number, and charge for each completed call he has made.
6. *Time of Answer or Disconnect*—Time entries, controlled by a master timing circuit, are recorded in minutes and tenths of minutes using the 24-hour day principle.
7. *Trunk number*—This number identifies the trunk circuit used by the calling subscriber. The various entries of this call can be assembled later at the accounting center.
8. *Entry number*—This code number denotes whether the entry is an initial, an answer, or a disconnect.

For each completed unit the three entries mentioned in (8) are recorded on the perforated tape. The initial entry records the calling number, the type of billing, and the called number if required; the second entry indicates the time of answer; and the third entry, the time of disconnect. These entries are chronologically interspersed along the tape with those of calls placed by other subscribers whose lines utilize the same common pool of AMA recording equipment. If a call is not completed, only the initial entry is recorded. These incompleted calls are discarded early in the accounting process.

Metropolitan Telephone Service

Equipment Adaptable to Various Control Systems

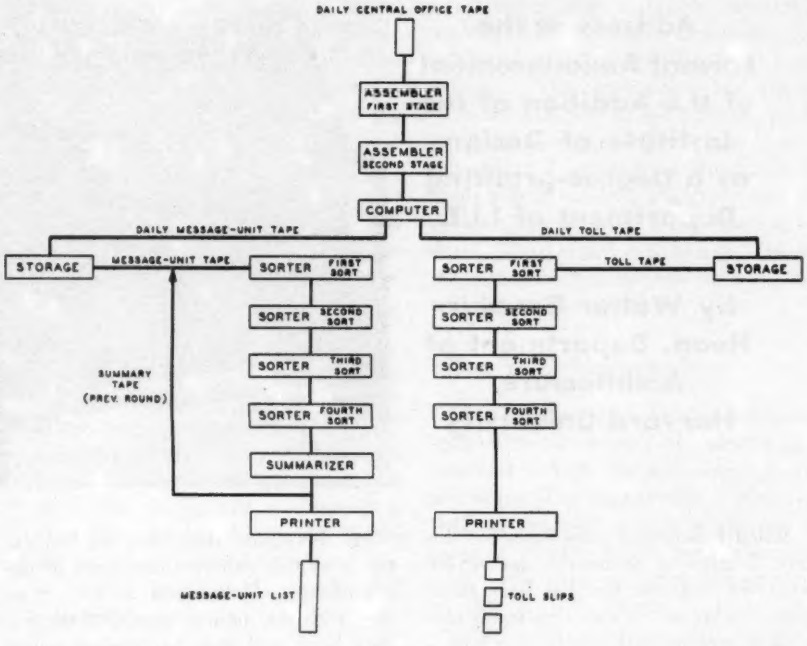
The operation of AMA is readily adaptable to several different versions of the common control system type of central office equipment. The newest of this type of equipment is the No. 5 Crossbar.

AMA equipment in the central office has been designed with an eye to flexibility and economy. It consists of recorders and their perforators, trunk identifiers, a master timer, and associated control and testing circuits. The recorder operates the perforator magnets as directed by the trunk identifier, the master timer, and the control circuits. The trunk identifier furnishes an identifying number for each of the maximum 100 AMA trunks with which it can be associated. This number provides the association at the accounting center of the three entries for each completed call. There is an identifier unit for each recorder. The master timer provides 6-second pulses which are required to operate the timing circuits in the recorders. Month, day, and hour timing is also supplied to the central office testing equipment in conjunction with trouble-shooting data.

The perforator is brought in on the connection only long enough to perforate the tape with the necessary information. This operation takes only .25 to .7 of a second per entry, depending on the type. The mechanism consists of 28 magnets arranged in two rows of 14 each. These magnets, when energized, actuate perforating pins, producing small indentations in the 3 inch wide tape. Embossed edges insure positive contacts for the reading equipment at the accounting center.

The 28 holes are separated into six groups designated A, B, C, D, E, and F. A has three holes used on a "one out of three" principle to give numbers 0, 1, 2. Groups B through F have five holes each, numbered 0, 1, 2, 4, and 7. These are used in the so-called "two out of five" additive system in which the desired number is the sum of two numbers, thereby identifying digits 1 through 9. The zero digit is identified by the 4-7 combination. For mechanical reasons, the 28 holes across the tape in any one line of an entry are staggered in checkerboard pattern. The next line in the tape then fills in the odd holes in the line.

AMA CENTER PROCESSING DIAGRAM



Process Tapes in Accounting Center

At a designated time each day, i. e. 3 a.m., the perforated tapes at the central office are advanced to provide a place for cutting. At any convenient time thereafter, the tapes are cut and forwarded to the accounting center for processing. This accounting office is usually centrally located in the metropolitan area it serves.

The equipment there consists of a battery of machines that assembles, computes, sorts, summarizes, and prints the data required to make up the subscribers' telephone bills.

Since the three entries of a completed call are separated from each other on the perforated central office tape, it is necessary to first assemble them together. By sorting all the entries by the trunk number, it is possible to quickly assemble the related ones. The assembler performs this function in two operations at a speed of about 80 coded digits per second.

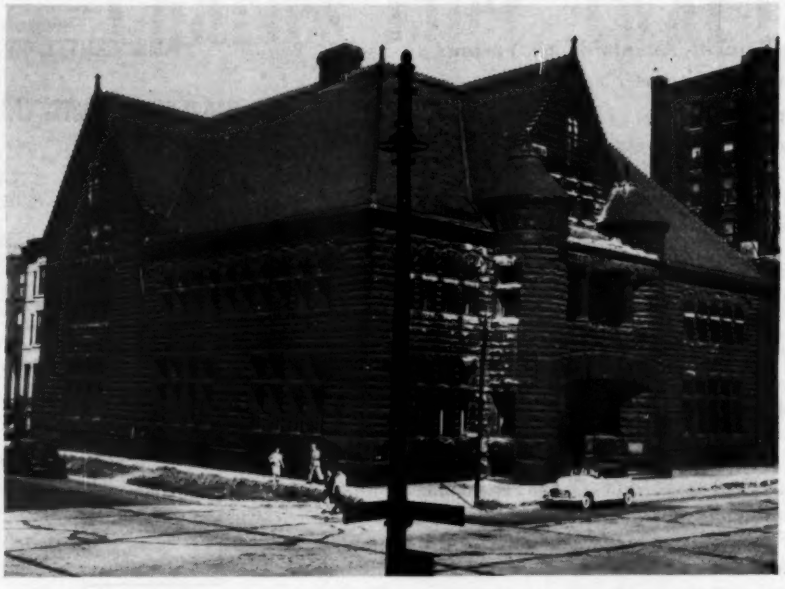
In the first stage, the central office tape is run through the reading equipment of the assembler. As the tape is "read", ten new perforated tapes, numbered 0 through 9, are made. The entries are sorted by the last digit of the trunk number; for example, 11, 21, 31, etc. The ten resulting tapes are then spliced together in numerical order and run through reading equipment in the second stage of the assembling process. Perforating equipment again makes up ten new tapes, this time resorting the entries by the tens digits of the trunk numbers. These final tapes are spliced and reeled together for further processing in the computer machine.

(*Continued on Page* 22)

DESIGN AND INDUSTRY

Address at the Formal Announcement of the Addition of the Institute of Design as a Degree-granting Department of I.I.T.

by Walter Gropius, Head, Department of Architecture, Harvard University



When I prepared some notes for this talk, I tried to summarize for myself what the changes are that have taken place during my own lifetime in the physical as well as in the spiritual world.

When I was a boy, my family was living in a city apartment with open gas-jets, individual coal-heated stoves in each room, including the bathroom, where warm water was heated for the bath each Saturday: that took two hours.

There was no electric street-car, no automobile, of course, no plane. Radio, film, gramophone, X-ray, telephone were non-existent.

The mental climate which prevailed in the 80's and 90's was still more or less of a static character. It rotated around a seemingly unshakable conception of the eternal truths. But rapidly this conception is fading away, changing into that of a world of incessant transmutation, of a relativity of all its phenomena. Time and space are no longer opposites but coefficients only of one and the same cosmic force. The sum of all of these tremendous changes during the last half century of industrial development has achieved a more sweeping transformation of human life than during all of the centuries since Jesus Christ combined.

Small wonder, then, that we feel the strain of this superhuman speed of development, which seems to be out of step with the natural inertia of the human heart and with our limited power of adaptation. This whirlwind leaves many bewildered and lost, unhappy, or with ruined nerves; but, as the great avalanche of progress in science and philosophy is roaring on at a tearing pace, we had better look out for the best means of bracing ourselves against inevitable repercussions.

We Must Face Facts

I do not believe that we can retard or deviate the trend of our world by reactionary or ostrich attitudes. The growing generation has to swim *with* the stream and must seek to equip itself to master its swift currents. The greater the courage we muster to face this bewildering impact of new realities and to recognize their forces instead of lulling our youngsters into a dream-world which no longer exists, the better chance there may be for the survival of our shaky world.

This country, in its new, if unsought, position of world leadership, has been silently called upon to create the spiritual magic which would equip it—beyond its might and wealth—with the means for peaceful world guidance. Whether we like it or not, here lies the personal responsibility of every one of us. We are well aware that consolidation of the American genius on the cultural level in addition to our material strength could bring salvation. For ideas are omnipotent. The spiritual trend of human development has always been guided by the thinker, the poet, the artist, whose creations are beyond expediency. Their prophetic anticipation has forced even powerful statesmen and mighty businessmen to follow their vision, as we find to be true all throughout history.

But the influence of the thinker and the artist could not have become effective if the people had been indolent and unresponsive. Only if the people were spontaneously ready to receive those seeds of an indigenous new culture could these spread and sprout. The growing unity of the people's attitude finally resulted in a social integrity—that is, in a moral consciousness which integrated the pattern of their physical environment into one coherent entity.

That state of grace of course cannot be created by an individual act or even by the will of a group. But it seems not to be in the American character to sit

tight and wait for the genius. Higher cultural quality can come from a refinement and an intensification of the American way of life and we are interested of course to see what factors should be strengthened so that we, ourselves, today could help to promote cultural progress. What we *can* do is to better prepare the educational way for the coming generation.

Creative Action Needed

I have come to believe that through creative *participation* in the arts people will build up a discipline which is the very basis of culture. It will lead to the unity of its visible manifestations, embracing everything from a simple chair to the house of worship.

Do our educational systems sufficiently provide for such creative participation in the arts, on which I put the emphasis?

When we look around, we often find a widespread belief that, if we only tap that stock of knowledge stored up in our universities, museums and libraries, absorbing it through intellectual processes, we shall then become well educated. True education, however, is certainly more than information and learning. One cannot reach this goal through intellectual disciplines alone. We seem to have forgotten that, since time immemorial, creative aesthetic disciplines in the arts have always generated ethic qualities.

In our universities, a student is so absorbed by studying music composed by others, poetry written by others, and architecture, painting and sculpture created by famous men of the past, that he rarely finds a chance to try his hand at making poetry, music or art of his own invention. Artistic creation, the most virile human activity, is even discredited today as feminine or "sissy." The inventive creative qualities of many a student, I am afraid, are being starved by the current over-valuation of bookish learning; but don't these qualities provide the very soil where new culture could take root?

We obviously need a change in attitude in regard to our *values*. An attitude which would encourage, support and promote the men of vision, the poet and the artist, and which would give them the rank they deserve within the body of our society. We certainly have recognized the essential value of the scientist today, but are we also aware of the vital importance of the artist or, as we might call him, the creative designer, who has to control the visual manifestations of our productive life?

As I am supposed to elaborate between industry and design as a specific issue of this broad cultural problem which so much puzzles this generation, may I illuminate the present-day status by a telling example? Some time ago, I found in the New York Times an article with the caption: U. S. STEEL TO MASS-PRODUCE HOUSE SELLING FOR $6000 INCLUDING LOT. After going into all the commercial details of the house, the article ended by saying:

> "The Corporation spokesman explained that one of the major aims in marketing the new product would be to get away from monotony in the design which has characterized many home colonies in the mass-produced field. The design will be Colonial in character and will be varied by the use of different pastel colors and distinguished ornamental plaques and pilasters."

You will agree that this naive advertisement of one of our most potent industries is rather characteristic of the cultural impoverishment and utter helplessness of our generation in its attempt to make our physical surroundings beautiful.

Design Must Excel

This example makes us realize, all of a sudden, that we still seem to be stuck with an irrelevant slip-cover civilization, as we might call it. Our sense of beauty has turned into a timid and insipid attitude which dares to offer us an imitative cosmetic skin treatment as a substitute for a creatively conceived design which should grow, instead, from the very bones of an industrial product.

Today we are indeed at the threshold of a new era in which American industry will have to make use of the essential value of higher quality through organic design. We have matured beyond the old American slogan, "bigger and better." Our industrial products will not only excel by good quality of their materials and manufacturing processes used but, in addition, also by the inherent beauty of their indigenous design. Fortunately conditions have already changed greatly.

When I came to this country, in 1928, I remember that a highly honorable trade-mark for products designated for cultural distinction was "Imported from Europe." This designation has almost vanished today, with our growing pride in things American. The change in attitude which I was talking about has already started, and with it grows our responsibility; for there is still much to be done. There is still a wide gap between the industrialist on the one hand and the designer on the other.

Team Work Necessary

The designer often fails to recognize sufficiently the impact of industrialization and its technical and economic implications. The industrialist is often impatient, assuming that it is possible to make a design before next Thursday which will then embellish his product so that it will become a best-selling standard. He sometimes still cherishes the notion that design is something to be added on, instead of an inherent quality which can result only from a laborious process through trial and error, in close collaboration with all concerned in its production.

There is plenty of evidence that the success of an industrial product simultaneously in the cultural, technical and economic fields depends entirely on a balanced team-work between the designer, the scientist, the engineer, the market analyst, and the salesman. If the aim of true team-work is to give the best possible service through closest integration of *all* of the factors involved in manufacturing a product, then the professional work of each member of the team is of equal importance for the final result. Consequently, each member must be of equal rank, which makes for the specific technique of team-work "implying collaboration and not direction—freedom of initiative, not the impress of authority" (. . .Herbert Read).

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Design and Industry

(*Continued from Page* 9)

That approach does not exclude, of course, the selection of a job captain by the team itself as a *primus inter pares* (first among equals) whose task it is to control and schedule the processes of integration. The further development of team-work will bring the artist, the designer, back into the fold of the community. From his ivory tower he will move closer to the test laboratory and to the factory, and he will become in the eyes of the people a legitimate brother of the scientist, the engineer, and the businessman. This circuit will be rapidly closed, I believe. Therefore, to fit the designer for his creative part within the industrial team and to bring him nearer the modern sources of production should be the predominant aim of our educational institutions of design.

Institute Started By Moholy-Nagy

When I shall try now to appraise the past and present endeavours in this field, here in Chicago, I offer as my credentials the fact that I have been absorbed throughout my lifetime by these problems, both in my own practice with industry and in the educational field. Looking back, I am proud that I have been instrumental in bringing Moholy-Nagy to the New Bauhaus, Chicago, as the Institute was called 12 years ago. His stature and reputation as a pioneer in integration and as a great artist and educator will still grow with the years.

When he started out here we both know that the Bauhaus movement had proved to be broad and fertile enough to grow in very different habitats and that different personalities could give it ever-changing interpretation. After esoteric beginnings abroad, the Bauhaus idea became the yeast in the modern art movement. After its consolidation in this country, it is by now internationally accepted and traditionally established. I should like therefore to review its orginal aims before I outline its transformation within the American scene.

What we preached in practice was the common citizenship of all forms of creative work, and their logical interdependence on one another in the modern world. We wanted to help the artist to recover the fine old sense of design and execution being one, and to make him feel that the drawing-board is merely a prelude to the active joy of fashioning. Building unites both manual and mental workers in a common task. Therefore all alike, artist as artisan, should have a common training; and, since experimental and productive work are of equal practical importance, the basis of that training should be broad enough to give every kind of talent an equal chance. And, since all these commending brains will have been through the same industrial mill, they will know not only how to make industry adopt their improvements and inventions, but also how to make the machine the vehicle of their ideas.

Men of this stamp are sure to be eagerly sought after. The Bauhaus felt that it had a double moral responsibility: to make its pupils fully conscious of the age they were living in; and to train them to turn their native intelligence, and the knowledge they received, to practical account in the design of typeforms which would be the direct expression of that consciousness. Our ambition was to rouse the creative artist from his other-worldliness and to re-integrate him into the work-a-day world of realities. Thus our conception of the basic unity of all design in relation to life was in diametrical opposition to that of "art for art's sake," and the even dangerous philosophy it sprang from: business as an end in itself.

Standardization Provides Leisure

This explains our concentration on the design of technical products and the organic sequence of their processes of manufacture, which gave rise to an erroneous idea that the Bauhaus had set itself up as the apotheosis of rationalism. In reality, however, we were far more pre-occupied with exploring the territory that is common to the formal and technical spheres, and defining where they cease to coincide. The standardization of the practical machinery of life implies no robotization of the individual but, one the contrary, the unburdening of his existence from much unnecessary dead-weight so as to leave him freer to develop on a higher plane.

But we had also to hold our own in another direction: against detractors who sought to identify every building and object in which ornament seemed to be discarded as examples of an imaginary "Bauhaus Style"; and imitators who prostituted our fundamental precepts into modish trivialities. The object of the Bauhaus was not to propagate any "style," system or dogma, but simply to exert a revitalizing influence on design. We did not base our teaching on any preconceived ideas of form, but sought the spark of life behind life's ever-changing forms.

Bauhaus A Leader

The Bauhaus was the first institution in the world to dare to embody this principle in a definite curriculum. To further the cause of its ideals, and to maintain the vigour and alertness of that community spirit in which imagination and reality can alone be fused, it had to assume the responsibilities of leadership. A "Bauhaus Style" would have been a confession of failure and return to that very stagnation and devitalizing inertia which I had called it into being to combat.

When Moholy-Nagy built up the Institute here in Chicago, he had the vision to lay its foundations in such a way that indigenous American design could be stimulated and developed. A genuine tool of cultural growth, the Institute took root after a stormy beginning. Its program had been broadened, compared to that of the Bauhaus in its general educational background as well as by much wider use of the modern means of visional communication.

When Moholy died, in 1946, Serge Chermayeff was appointed President. Soon after the school's enrollment reached close to 400 students in the day sessions. This enrollment has since been steadily maintained. I should like to express in advance my great personal satisfaction that the Institute, under Chermayeff's able leadership, is now moving independently beyond its former achievements and those of the original Bauhaus towards what I believe may prove to become the decisive link between the designer and industry in this country.

(*Continued on Page* 28)

Second Prize

Winner of WSE's Technical Paper Contest

The Structural Aspects of Power Plant Design

by Paul Rogers, Structural Design Engineer, Sargent & Lundy

This prize paper deals with special problems of power plant design and their analysis. The author emphasizes the need for knowledge of advanced theory.

The structural design of power stations is a rather complex procedure, and, in most cases, requires special analyses not ordinarily employed in the design of conventional buildings. Although continuity of building frames has become an accepted practice, most ordinary structures can be designed on the basis of the elementary structural theory.

This analysis includes only those phases of power plant design which require particular attention. These problems require sound judgment of experienced engineers, and, quite often, the use of higher structural theories.

Built on Rivers

Many power stations are being built on or close to rivers in order to obtain a steady volume of condenser cooling water. To build structures in the dry, sheet piling walls are driven in the soil and the water within the walls pumped out, permitting further excavation and construction.

Although occasionally cellular cofferdams are required, ordinarily single wall cofferdams, supported by wales and struts, suffice.

The design of sheet piling, both for cantilever and for anchored walls, ordinarily follows methods described in several publications by the U. S. Steel Corporation. These, in turn, are based on studies made by Krey & Blum in Germany.

Recent investigations by Prof. Tschebotarioff indicate that the point of inflection can safely be assumed to be at the surface of the dredged side, and the value of the theoretical passive resistance be doubled. This means considerable saving, compared with the prevailing conservative design.

Although designers can seldom afford the time required for rigorous analysis, they should bear in mind that sheet piling supported by several rows of wales are beams on elastic foundation. Proper allowance should be made for the elastic deformations of the supporting members.

Use Unloading Bridge Cranes

Many river-front power plants are not served by rail, with the result that equipment, including construction materials and machinery, must be brought in on boats and barges. Practically all mid-west rivers are subject to heavy flood conditions. Therefore, the unloading is usually done by the use of heavy duty unloading bridge cranes, which are so designed as to have one end above ground, and the other end extended to navigable water. This may necessitate long span bridges with cantilever ends, sometimes up to 200 tons capacity.

Such bridges, if of trussed construction, should always be investigated for secondary stresses which in some cases approach or even exceed the primary stresses due to loads.

The riverside end of such bridges usually rests on heavy concrete piers. Since the plant must continue operation even during flood times, these piers should extend above maximum high water.

Barge unloader piers are subject to considerable loads, such as dead load of the pier and bridge, live load on the bridge, wind load, force of current, ice pressure, floe ice, debris and barge collision.

Separate Footings Urged

If the soil has a good bearing capacity and no excessive settlement is anticipated, then the building columns may rest on footings bearing directly on the soil. It is preferable to have individual footings, which are easy to design, and may have differential settlements which, if of small magnitude, do no major damage.

Quite often it is necessary to combine several column footings, in which case the resulting raft foundations have to be designed on the basis of continuity; and the elastic characteristics of the soil cannot be ignored. If the soil does not possess sufficient bearing capacity, pile or caisson foundations are needed.

Piles may be of wood, steel, precast concrete, or cast in place concrete.

For heavy concentrated loads, caissons are commonly used. In order to save concrete and reduce weight, hollow caissons are often preferred.

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Structural Aspects of Power Plant Design

(*Continued from Page* 11)

Hollow caissons are usually poured to a certain height above the ground and then sunk. The cutting edges penetrate into the soil, and the dirt is excavated through the inside. Additional pours are added until the caisson has sunk to its proper depth. Then a thick bottom plug is poured and the caisson capped to receive the column piers.

Concrete Structures

Although most of the buildings in connection with power plants are framed of structural steel, certain structures are built of concrete and some of them require special attention.

The crib house contains the pumps which transmit large volumes of water to the main buildings. It also contains racks, grills, travelling screens, etc. It is mandatory to design such crib houses for continuity, perhaps not so much for the obtained economy, but rather to get a clear picture of the complex moment and shear distributions. Quite often wall-like, very deep girders carry heavy loads, and these have to be designed as diaphragms.

The intake and discharge tunnels usually are rectangular or square in cross-section. These are to be designed for exterior soil and surcharge loads for empty condition, and water pressure when full. One should bear in mind that the water in these tunnels is under pressure, which may amount to considerable additional head.

Track hoppers, car dumpers, tunnels are exposed to heavy soil pressures and surcharges. Track carrying girders and supports have to be designed as railroad structures.

Occasionally the condensers are not connected directly to the turbines, but placed far below in so-called condenser wells. This is advantageous when the plant is far above the source of condenser cooling water and heavy pumping would be necessary.

Such condenser wells are large diameter (40′ to 80′) cylinders with thick (3′ to 6′) concrete walls, constructed and sunk in the same manner as hollow caissons. Due to large openings in the walls near the bottom, these cylinders have to be designed by proper analysis and good judgment by experienced engineers. The bottoms are thick (6′ to 10′) discs and on the top there are heavy girders, beams and slabs to receive the turbo-generator and associated equipment.

The design of turbine foundations presents very unusual problems seldom encountered in general engineering practice.

In recent years, the capacities of turbo-generators have been greatly increased. There is nothing unusual about a 100,000 KW. unit. Considering the corresponding price of such units, there should be no doubt about the supporting capacity of the turbine foundations.

The following is a brief review of the requirements for a proper turbine foundation design:

1. The foundation should have stiffness, rigidity and sufficient mass. It is advisable to have a concrete mass at least equal to 2½ times the weight of all rotating parts.
2. No elastic deformation, whether due to flexure or axial load, or the combination of these two should exceed 0.020 inches.
3. No elastic deformation should have a frequency that produces resonant vibrations. This requires different deformation values for units of different speeds.
4. The turbine foundation should be designed to support the following loads or resist the following forces: the weight of the turbine, generator, condenser, cooling equipment, piping, accessories, etc.; the forces due to torque, longitudinal and transverse expansion of the unit, guide bracket reactions, vacuum loads, pipe thrusts, temperature changes, earthquake disturbances and any other forces.

It has been suggested that modern pretressing methods be used for at least some parts of turbine foundations.

The operating and fan supporting floors in main buildings are usually concrete slabs supported on steel girders. Due to the possibility of having equipment replaced or repaired anywhere on these floors, they are designed for heavy live loads. Special attention must be given to areas where the rotor may be pulled out for repairs, and to areas below and adjacent to heavy fans, which may cause resonant vibrations.

In case concrete beams are poured monolithically with the slabs, it is not recommended that advantage be taken of tee beam action, because future alterations may necessitate cutting large holes in the slabs. The same reasoning dictates the design of slabs as simply supported, in spite of the obvious economy in continuity.

Basement walls of power plants are often exposed to water pressure of high head. In order to secure water-tight concrete construction, such walls should be designed on the basis of the uncracked section, so that under no circumstances should a certain allowable tensile stress in the concrete be exceeded.

In case the power plant is not in the vicinity of major waterways or lakes and the well water supply is limited, it may be mandatory to cool and re-use the large quantities of condenser cooling water.

In modern practice, huge reinforced concrete cooling towers are sometimes used. These have the shape of a hyperboloid, with a base up to 200 feet in diameter and a height up to 300 feet.

Steel Superstructures

The superstructures of the boiler, turbine room and crusher houses, are usually structural steel, although occasionally reinforced concrete frames are used.

Steel is advantageous for its speedy erection and for its adaptability to changes and additions. Except for the operating and fan floors, all other floors and galleries preferably have open grating flooring which rests on steel beams.

This kind of flooring facilitates easy air circulation throughout the plant, and also provides visibility to the operators in observing different parts of the plant.

Reflecting mirror arrangements are often used to enable the operator to observe equipment that is not easily accessible, although these are replaced in some plants by the installation of industrial television.

It is customary to design and construct the floor beams and girders as simply supported. This is because of the many changes which may occur in the lifetime of a power station.

It is important to analyze and reinforce the steel framing against wind stresses. The wind shears should be

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OCTOBER 23, 1950

Featuring Col. John Slezak

"The Engineer and American Destiny"

Col. John Slezak (WSE), an industrialist with unusually varied interests will acquaint Western Society's members and guests with "The Engineer and America's Destiny."

He is president of the Turner Brass Works, Sycamore, Ill. Col. Slezak has served the government on Ordnance and Munitions boards in critical times since 1918. He succeeded Brig. Gen. T. S. Hammond as District Chief of the Chicago Ordnance District's Industrial Division in 1944. Col. Slezak was responsible for procuring approximately $5,000,000,000 worth of weapons for our fighting troops in World War II, and was awarded the Legion of Merit and the Oak Leaf Cluster.

Among his other interests are the Illinois Manufacturers' Association, of which he is vice-president, American Ordnance Association (director), and Illinois Institute of Technology (trustee and member of the executive committee).

In addition, Col. Slezak is chairman of the board of the Kable Printing Co., Mt. Morris, Ill., and of the Pheoll Manufacturing Co., Chicago. He is director of the Illinois Bell Telephone Co.; the Whiting Corporation, Harvey, Ill.; Felt & Tarrant Manufacturing Co., Chicago; and Burgess Norton Manufacturing Co.

WSE's president, Mr. H. P. Sedwick will introduce Col. Slezak with brief remarks and preside at the dinner.

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Text Of Executive Orders On Preserving Records

Because of their importance we are publishing in full the following government orders just issued.

Text of Executive Order On Preserving Records

By virtue of the authority vested in me by the Defense Production Act of 1950, and as President of the United States, and in order to provide an appropriate basis for action under Title IV of the Defense Production Act of 1950, it is hereby ordered:

1. Every person who sold or delivered goods or services, or offered them for sale or delivery, in the course of trade or business during the period from May 24, 1950, to June 24, 1950, inclusive, shall preserve all his records for such period relating to:

(a) The prices received or asked for such goods or services; and

(b) The labor, material, acquisition, and other costs incurred in connection with such goods or services.

2. This order does not apply to:

(a) Records of an individual relating to wages or salary received by such individual;

(b) Records relating to sales of agricultural commodities by the individual producer thereof; and

(c) Records relating to the following, which are exempt from control under section 402(e) of the Defense Production Act of 1950; (i) prices or rentals for real property; (ii) rates or fees charged for professional services; (iii) prices or rentals for (a) materials furnished for publication by any press association or feature service, or (b) books, magazines, motion pictures, periodicals, or newspapers, other than as waste or scrap; or rates charged by any person in the business of operating or publishing a newspaper, periodical, or magazine, or operating a radio-broadcasting or television station, a motion-picture or other theater enterprise, or outdoor advertising facilities; (iv) rates charged by any person in the business of selling or underwriting insurance; (v) rates charged by any common carrier or other public utility; and (vi) margin requirements on any commodity exchange.

3. For the purposes of this order:

(a) The term "person" includes an individual, corporation, partnership, association, or any other organized group of persons, or legal successor or representative of the foregoing, and includes the United States or any agency thereof, or any other government, or any of its political subdivisions, or any agency of any of the foregoing.

(b) The term "prices" includes rentals, commissions, margins, rates, fees, charges, and allowances paid or received.

(c) The term "goods" has the same meaning as the term "materials" in the Defense Production Act of 1950 and includes raw materials, articles, commodities, products, supplies, components, technical information, and processes.

HARRY S. TRUMAN.

Text of Order Setting Up Production Authority

Section 1. Purpose:

1. The purpose of this order is to establish the organization necessary to carry out the functions assigned to the Secretary of Commerce by Executive Order, "Delegating Functions of the President Under the Defense Production Act," and is issued pursuant to the authority vested in the Secretary by such Order and by Reorganization Plan No. 5 of 1950.

Section 2. Establishment of National Production Authority:

1. There is hereby established in the Department of Commerce a National Production Authority which shall be headed by an Administrator appointed by the Secretary. The National Production Administrator shall report and be responsible to the Secretary.

2. The National Production Authority shall perform the functions and exercise the powers vested in the Secretary of Commerce by Executive Order, titled, "Delegating Certain Functions of the President Under the Defense Production Act of 1950." These functions shall include but not be limited to: (1) Determination of the requirements for materials and commodities needed for defense, civilian, foreign, and all other purposes; and (2) Formulation and execution of the policies and programs necessary for the fulfillment of such requirements.

Section 3. Establishment and Functions of the Advisory Committee on Priorities Administration:

1. There is hereby established an Advisory Committee on Priorities Administration consisting of the Administrator as Chairman and representatives from the following agencies and such other agencies as the Secretary may designate from time to time:

Department of Defense
Department of the Interior
Department of Agriculture
Department of State
Department of Labor
Department of the Treasury
Office of International Trade (Department of Commerce)
Economic Cooperation Administration
Atomic Energy Commission
Housing and Home Finance Agency.

2. The National Security Resources Board shall be invited to designate an observer to attend all meetings of the Advisory Committee on Priorities Administration.

3. The Advisory Committee on Priorities Administration shall serve in an advisory capacity with respect to policy and program matters affecting the interests of the represented agencies. More specifically, the Committee shall: (1) Consider all factors relevant to the determination of the direct and indirect military, civilian, and foreign requirements for essential and critical raw materials and industrial products; (2) Recommend programs for the production and allocation of such materials and products; and (3) Review proposed orders and regulations and perform such other functions as the Chairman may assign.

4. The Administrator, as Chairman, is authorized to: (1) Establish such subcommittees and working groups subsidiary to the Committee as he may determine to be necessary; and (2) Establish rules and regulations governing the procedures and operations of the Committee and its subgroups.

Section 4. Organizational Adjustments:

1. The following industry divisions of the Office of Industry and Commerce of the Bureau of Foreign and Domestic Commerce, together with their personnel, are transferred to the National Production Authority: Iron and Steel; Met-

Something *NEW* Is Being Added

Speakers Will Address WSE Luncheon-Meetings

Every Thursday Noon, Starting October 19.

Mr. W. P. Marston, chairman of the General Program Committee has invited noted speakers to give *short* talks on a variety of *general subjects.*

Luncheon-meetings will start promptly at 12:15 and end promptly at 1:30. These luncheons are *in addition* to regular Monday night meetings.

Luncheon $1.15

Reserve October 19 for the First Luncheon-Meeting

(*Continued from Page* 16)

als and Minerals; Rubber; Textiles and Leather; Chemicals; Forest Products; Construction; Machinery and Equipment; General Products; Motion Pictures; Food; Petroleum; Fuels and Energy.

2. The Division of Small Business and the Marketing Division of the Office of Industry and Commerce are transferred to the National Production Authority, together with related personnel.

Section 5. Administrative and Field Services:

1. Pending further development of the organization and facilities of the National Production Authority and until otherwise directed, the central personnel, accounting, information and other administrative service facilities of the Office of the Secretary shall provide administrative and other services to the National Production Authority.

2. In addition, any necessary field services will be provided by the Department Field Service pending development of a sufficient volume of field work to justify separate field offices for the National Production Authority.

Section 6. Reemployment Rights:

1. All permanent employees of the Office of Industry and Commerce who are transferred by the terms of this order to the National Production Authority and who remain with that organization and perform satisfactory service shall be entitled to re-employment rights in an appropriate position of at least the same grade held on the effective date of this order, when the transferred functions are returned to that Office. Other permanent employees of the Department who are transferred individually to the National Production Authority shall be entitled to re-employment rights under the same terms in the bureau or office from which transferred when their services are no longer needed in the National Production Authority.

Section 7. Internal Organization:

1. The temporary internal organization of the National Production Authority shall consist of the following:

Administrator
Deputy Administrator
General Counsel
Executive Officer
Director of Public Information
Office of Civilian Requirements
Office of Labor Production
Office of Manpower Requirements
Office of Small Business
Assistant Administrator for Program Determination
Assistant Administrator for Industry Operations.

Section 8. Status in the Department:

The National Production Authority shall operate as a primary organization unit of the Department of Commerce and shall be administered in conformance with established Departmental policies, regulations and procedures as set forth in the Department of Commerce *Manual of Orders.*

Section 9. Records Transfer:

1. All records remaining in the custody of the Department of Commerce relating to the War Production Board and its predecessor and successor agencies and transferred to the Department by Executive Order 9841 of April 23, 1947, are transferred to the custody and use of the National Production Authority.

Section 10. Effect on Other Orders:

1. Any other orders or parts of orders the provisions of which are inconsistent or in conflict with the provisions of this order are hereby amended or superseded accordingly.

Section 11. Effective Date:

1. This order is effective Sept. 11, 1950.

CHARLES SAWYER,

Announcement has been made of the national meetings of the American Society for Testing Materials—for 1951 and 1952—as follows:

1951 A.S.T.M. Spring Meeting and Committee Week
Cincinnati, Ohio
March 5 to 9, inclusive

1951 A.S.T.M. Annual Meeting
Atlantic City, N. J.
June 18 to 22, inclusive

1952 A.S.T.M. Spring Meeting and Committee Week
Cleveland, Ohio
March 3 to 7, inclusive (probably)

1952 A.S.T.M. Annual Meeting
New York, N. Y.
June 23 to 27, inclusive
The biennial Apparatus and Photographic Exhibits will be held in conjunction with this Annual Meeting.

National Conference on Industrial Hydraulics

Sixth Annual Meeting, October 18-19

The sixth annual National Conference on Industrial Hydraulics will be held on October 18 and 19 at the Hotel Sherman.

This conference is sponsored by the Illinois Institute of Technology and Armour Research Foundation with the cooperation of Western Society of Engineers, American Society of Lubrication Engineers, and the local sections of American Society of Civil Engineers, American Society of Mechanical Engineers, Society of Automotive Engineers, American Institute of Chemical Engineers, Institute of Aeronautical Sciences and American Society of Agricultural Engineers.

Mr. Otto J. Haha, vice-president of the Hannifin Corp., Conference director, and F. W. Edwards, director of the department of Chemical-Engineering at I.I.T., Conference secretary, announce that an outstanding program of technical meetings has been arranged.

Among the speakers representing I.I.T. will be W. A. Lewis, Dean of the Graduate School, J. T. Rattaliata, Dean of Engineering, and Dr. J. H. Rushton, director, department of Chemical Engineering. Dr. H. A. Leedy, director of Armour Research Foundation will also speak.

Among those representing industry will be Mr. H. E. Churchill, Studebaker Corp.; Calvin V. Davis, vice-president, Harza Engineering Co.; B. R. Teree, director of Hydraulic Engineering, New York Air Brake Co.; Wayne H. Worthington, Director of Research, John Deere Tractor Works; D. J. Bergman, Chief Engineer, Universal Oil Products Co.; James Hartney, Chief Engineer, Carnegie Illinois Steel Co.; Carl E. Schmitz, vice-president, Crane Packing Co., as well as many other well known engineers and industrialists.

From other schools are Merrill B. Gamet and Lewis H. Kessler, Northwestern Technological Institute; and John H. Dawson, Oklahoma A & M.

The All-Society banquet on Wednesday evening will be addressed by John P. Sanger, vice-president U. S. Gypsum Co. Mr. Sanger will speak on "The Findings of the Hoover Commission and What We Can Do About Them."

Additional Conference information can be obtained from Mr. Frank W. Edwards, the Conference Secretary, CA 5-9600 or from W.S.E. office, RA 6-1736.

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CRERAR LIBRARY Notes and News

New faces in the Technology Department will introduce WSE members to the fact that there have been important changes in the staff of the Crerar Library during recent months.

Kanardy L. Taylor, Assistant Librarian and member of the staff since 1934, left Crerar to join the Army Medical Library on October 1 as executive assistant to the director. Kenneth L. Fagerhaugh, Research Librarian since April, 1948, has been assigned the duties of the Assistant Librarian.

Carmen Wilson, Assistant Chief of the Technology Department since January, 1949, has been appointed Chief to succeed H. Einar Mose who retired on August 31 after more than 25 years with the Library.

Two new reference librarians have been added to the Technology Department staff—Huston E. Mount and Edward W. Quinn. Mr. Mount has his Master's Degree in physics from Northwestern University and is a graduate from the Library School at the University of Illinois. Mr. Quinn has his degrees in chemical engineering from the Cooper Union Institute of Technology and from the Graduate Library School at the University of Chicago. Supplementing Miss Wilson's training in chemistry, these new appointments strengthen the staff of the Library serving engineers and other technical readers.

— — — — —

Reprints of 175 papers of the Fourth World Power Conference, London, July 10-15, 1950, have been received by the Library, and will be available for our engineering readers until the transactions of the conference are published. A wide range of power problems are covered, including energy resources and power development; solid, liquid and gaseous fuels; steam and water power and plant design; engines; atomic energy; and other sources, ending with a summary of "Heat Pump Progress in the United States." The subject matter of the Conference was treated from the engineering and economic viewpoints, as distinguished from the sociological and political.

A.S.M.E. Calendar for The Month of October

October meetings of the American Society of Mechanical Engineers have just been announced.

Tuesday, October 3, at 7 p.m., G. A. Gaffert, a partner, Sargent & Lundy, Consulting Engineers, will speak on the subject "New Developments in Steam-Electric Power Stations." The meeting, sponsored by the junior group will assemble in the auditorium, 7th floor, 84 E. Randolph St. A movie, "New Power for America" will be included. Meeting chairman, A. J. Snider and Junior group co-chairman F. H. Kessler invite members and guests to dine in W.S.E.'s dining room.

A symposium on "Design and Use of Graphic Instrument Panels" will be sponsored by the Industrial Instruments & Regulators Division on Tuesday, October 17 at 84 E. Randolph. Speakers will be D. M. Boyd, Jr., Instrument Engineer, Universal Oil Products Co., M. B. Lorig, Chief Engineer, Panellit, Inc., J. M. Lawson, Chief Engineer, Globe Oil & Refining Co. and G. H. Burnett, Central Engineering Div. Corn Products Refining Corp. Meeting chairman, A. J. Rosenberger, promises slides of operating installations. Meeting begins at 7:45 p.m. on the 7th floor. Dinner will be served from 6:15 p.m. in W.S.E.'s fifth floor dining room. Phone dinner reservations to FI 6-2990.

Chicago Section of ASME has joined W.S.E. and six other technical societies, in cooperation with Armour Research Foundation of IIT, in presenting the ten sessions of the Sixth Annual National Conference on Industrial Hydraulics. This conference will be held Wednesday and Thursday, October 18 and 19 at the Sherman Hotel. For details, members should call Frank W. Edwards, Conference Secretary, CAlumet 5-9600.

The Woman's Auxiliary of ASME will tour the home furnishings section of the Merchandise Mart on Friday, October 27 at 12:15 p.m. The tour will cover new furniture, floor coverings, draperies, model kitchens with equipment in operation and a color clinic from *House and Garden*. Price of the tour is 60c, the luncheon, $1.25. Phone reservations to FI 6-2990, and indicate a choice of meat or fish.



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30,000 New Customers Use Gas Heat, Budd, Public Service Co.

"Despite the great increase in suburban residential building since the war, which resulted in rapidly rising demands for gas for cooking and water heating, the Public Service Company of Northern Illinois, since 1946, has authorized 30,000 customers to heat their homes with gas," reports Britton I. Budd, president of the company.

This was due to three factors:

1. A broad construction program by Public Service Company resulting in extensive additional storage facilities and large size bulk distribution mains.

2. Conversion of the company's 800 BTU gas service area to 1000 BTU straight natural gas, thus increasing distribution capacities.

3. Construction of additional facilities by Natural Gas Pipeline Company of America in 1947 and 1948 which resulted in the completion of a second pipeline from Texas to the Chicago area. This resulted in additional supplies of natural gas being made available to Public Service Company.

Despite this expansion in the company's gas service facilities, the demands for gas heat since the war have outdistanced the gas supply to such an extent that upwards of 28,000 individual residences are still waiting for company permission to install their gas furnaces.

As a result, there is no possibility of supplying gas heat to these waiting customers pending construction of the proposed third 30-inch natural gas pipeline from the Texas gulf coast to northern Illinois. Completion of this line is now tentatively scheduled for the end of 1951.

Restrictions on the use of gas for house heating, which have been in effect since July, 1946, are thus certain to continue for at least another year even though the new pipeline from Texas, now under way, goes ahead on schedule.

When the company is assured of completion of the new line, it is expected that those now on the gas heat waiting list can be authorized to install their gas burners. Any delays in the plans for completing the pipeline due to the war situation would mean similar delays in getting gas heat for those on the waiting list.

The companys' postwar expansion and conversion program is now virtually completed. Peak load and emergency supplies of gas have been provided by the installation of natural gas storage and the addition of facilities for the storage of liquified petroleum gas and oil, which may be converted to gas as needed. The company also has installed more than 280 miles of steel distribution mains, together with several new supply and regulator stations.

As a result of the three-year conversion program, the company now serves straight natural gas to all of its 232,000 residential, commercial, and industrial gas customers in 128 suburban and northern Illinois communities outside Chicago. Of this total, 220,000 are residential customers, of which about 45,000 are users of gas for space heating.

"The large, unfilled demand for gas heating," Budd said, "is due to an enormous postwar increase in suburban home building coupled with a price ratio which in recent years has favored gas over other house heating fuels.

"Even prior to the war, when gas was relatively more expensive as compared to oil and coal, there was a steady demand for gas for home heating because of the cleanliness and automatic control features.

"The wartime change in relative price ratio in favor of gas for home heating accelerated this demand at a time when war shortages of material and labor prevented the pipeline companies from expanding their facilities.

"Since the war, home building has increased in our gas service area, thus adding to this huge backlog of demand for gas heat. A total of 40,600 permits for new residences were issued in this area alone during the 4½ year since the war.

"We regard the complete elimination of our gas heat waiting list as our first future gas service responsibility."

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Engineers Need Publicity

John D. Waugh declared at a meeting of the A.S.M.E. in Worcester, Massachusetts, that engineers should be aware that their public relations "symbol" has a direct bearing on their income and the security and prestige of their positions.

Mr. Waugh, of Pendray & Leibert, New York public relations firm, continued: "Individually and collectively engineers have an important stake in improving their public relations so that the profession will achieve wider public understanding, with its attendant benefits. To advance their public relations standing, engineers should relate their activities to the public interest by making more widely known the role of the engineer in building modern society.

"The relative obscurity of engineers was commented upon recently in the editorial pages of a leading New York newspaper which said: 'In a predominantly engineering civilization—a civilization surrounded and sustained by the works of the engineer, and incapable of living for an hour except as these almost miraculous constructions function as they were intended to—it is remarkable how few engineers ever reach public prominence. We duly honor our poets and statesmen, our philosophers and soldiers and great salesmen and scientists, but we seldom know who our engineers are.' "

Must Capture Imagination

Mr. Waugh said the indifference on the part of the public to the many achievements of the engineering profession is not due to the technical nature of the engineer's work. Scientists, often working in the purely abstract and highly technical realm, have done a superb job of dramatizing their profession, he declared. Their stories, he said, are told and retold, their counsel is sought, and their advice is very frequently accepted, adding that the very fact of their recognition should dispel the idea that the public is not interested in technical subjects and the personalities behind them.

"What the scientists have done to capture the imagination of the public is to strip abstract and mathematical subjects of their technical embroidery and explain them in terms of human interest and public benefit," Mr. Waugh declared. "The results of their research imply progress in national defense, public health, advancing living standards, and many other subjects of general concern and interest. Engineers could do the same thing quite as capably in their fields of endeavor and establish a greatly improved symbol in the public mind.

Need Rounded Personality

"The individual engineer's stake in public relations can be spelled out in terms of how he will benefit by participation in public affairs. Qualification for management posts is often based on the many facets of a man's personality, seldom on his deep immersion in any one subject. Engineers experienced in dealing with people are often selected to represent their company on important matters. Engineers who become successful in dealing with people, in addition to their understanding of cold materials, are better able to put across engineering ideas and changes, develop personal prestige, and advance to greater engineering ideas and changes, develop personal prestige, and advance to greater engineering responsibility."

Obituaries

Internationally known authority on steam power plant design, George Frederick Gebhardt, died March 22, 1950. Mr. Gebhardt's death was recently reported to W.S.E. by Illinois Institute of Technology where he headed the mechanical engineering department.

Mr. Gebhardt had been a W.S.E. member since 1907, and served as its third vice-president from 1914 to 1915. He was the author of the widely used textbook "Steam Power Plant Engineering."

Mr. F. A. Niemann, inventor and mechanical engineer with Felt and Tarrant Manufacturing Company until his retirement, died on January 30, 1950. He was 72 years old. Mr. Niemann became a member of W.S.E. in 1919.

W.S.E. has just learned from relatives of Fredrick Lester Jeffries that he died on November 19, 1949 at the age of 75. Mr. Jeffries, a retired master mechanic, had been a member of W.S.E. since 1906.

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Mechanical Accounting for Metropolitan Telephone Service

(*Continued from Page 7*)

These final tapes are spliced and reeled together for further processing in the computer machine.

Computer Figures Chargeable Time

In the computer, the chargeable time for each completed call is computed. In addition, uncompleted and test calls are discarded. Taken into consideration in computing is a timing allowance to prevent overcharging the subscriber. For message unit calls, the number of message units is computed according to the message billing index. Detailed billing is available for certain toll calls, and may be provided for message unit calls where required. To accomplish this the computer fabricates several new tapes, namely: (1) message unit, (2) message unit detail, if required, (3) toll, (4) straddle, and (5) observing.

The message unit tape is sorted by the central office code, or by one digit of the calling subscriber's number if only one prefix is involved. All completed message unit calls with less than 99 message units each are entered, since this amount is the physical capacity of the present indexing method. Only the calling number and the number of message units are shown.

The message unit detail tape yields more detailed information than the message unit tape on completed message unit calls of 99 or less units. It provides the calling subscriber's number, called numbering area, called subscriber's number, time of answer, the length of conversation in tenths of minutes, plus the number of billable message units.

The toll tape provides similar details on all toll calls of 99 minutes or less.

The straddle tape contains all entries of message unit calls of more than 99 message units duration, entries of toll calls over 99 minutes, and entries of calls in progress when the central office tape is cut. The unmatched entries of these straddle calls are thereby available to match any entries from the previous or following day's tapes.

The observing tape contains all details of calls placed over lines selected for service or complaint observing. These entries also appear on the message unit or the toll tape, depending on the calls.

Billing Consolidated into Rounds

All the processing in the accounting center is done daily as the central office tapes are received. However, at this point, the billing information is so consolidated that it is not economically justifiable to carry through the balance of the accounting operations on a daily basis.

Therefore, accounting periods, called "rounds," are used. The term, "round," applies to the successive groups of days between billings. For six period billing in a calendar month, five day rounds hold. The six rounds are numbered from 0 to 5. Different central offices may require the use of different length rounds.

The daily tapes of each type produced by the computer are spliced with like tapes for the same round. At the end of a round, the message unit, the message unit detail, and the toll tapes are ready for a sorting process that results in complete numerical grouping by calling subscribers' numbers. The sorter machine produces in succession units, tens, hundreds, and thousands digits tapes. These are then spliced and reeled together.

After sorting, the message unit tape is summarized by telephone number, and all the message units for calls made by each number in each round are added together. For later rounds in any one billing period, the summarized message unit tape for the previous round is spliced to the message unit tape for the current round, then sorted and summarized by telephone numbers to provide a cumulative total of message units.

The message unit detail and toll tapes are not summarized after sorting because detailed billing of calls by rounds is required of them.

At this point, the final process of printing is accomplished. The sorted toll and message unit detail tapes and the summarized message unit tapes are printed after each round for use in making up final bills on terminated service and transferred accounts. The tape printed from the message unit tape after the last round of any billing period, provides the total billable message units for each subscriber for that month. Toll tickets are printed from the toll tape for each subscriber by rounds showing full information on toll calls made. Detailed slips are printed from the message unit detail tape where required, giving complete information on all message unit calls made.

The straddle and observing tapes produced by the computer do not go through the sorting and summarizing process, but are used to print daily straddle pages and observing slips for prompt analysis.

(*Continued on Page 23*)

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Mechanical Accounting For Metropolitan Phones

(*Continued from Page* 22)

A process sequence chart for the accounting center is shown in the diagram. In addition to the normal operations required to provide complete billing information and observing data, several tapes are made and processed to provide periodic accuracy and performance checks on the equipment.

There are various stock entries used to record certain information pertinent to classifying and identifying different tapes and operations indicated on them. For example, an end of tape pattern is used where cutting of a tape is required. It contains all information required for identification and subsequent processing of that particular tape including a month, day and hour pattern, and an easily recognized splice pattern to indicate where the tape should be cut.

Method Improved by Test

It is obvious that this accounting process, to be practical, would have to attain a very high degree of accuracy. Results of an exhaustive test period at one of the first AMA installations met with all expectations. Approximately 248,000 calls were originated, including message unit and toll messages, non-completing calls such as busy and don't answer calls, flat rate non-AMA calls, and miscellaneous irregular calls.

Final results of the test showed that only one completed call had apparently been overcharged, and less than .06% of the total message unit and toll messages were undercharged. With certain circuit and operating procedure changes, any further possibility of overcharging has been further minimized and a reduction in the percentage of undercharges has resulted.

Maintenance has been simplified, but at the same time provides a constant check on the equipment. In the No. 5 Cross-bar central offices, trouble recorder cards for the central office equipment also contain provisions for detecting trouble in the AMA equipment. Special testing tapes are periodically run through the central office and the accounting center equipment to provide accuracy checks. In addition, routine maintenance procedures are up to check mechanical adjustments and replace worn parts.

As with any new system, improvements on the present equipment have been designed and are being studied by the Bell Laboratories for their practical aspects. These advances aim at greater flexibility, improved operation and speed, and greater economy. One feature will include the conversion of message information from perforated tapes to punched cards for processing with conventional business machines.

This new accounting method is one of the most significant advances in telephone development since the invention of dial equipment. Not only does it provide more efficient telephone service to customers, but it does so with a very high degree of billing accuracy. Equally important, it provides a major stepping stone in the extension of customer toll dialing to any desired degree. Only time will furnish a complete picture of its value in the advancement of telephone communications.

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Siamese Type Bridge To Span Chicago River

Excavation work for the new Congress Street Siamese twin type bridge has been started by M. J. Boyle and Company, general contractors. The bridge, to cost three million dollars, will be the Congress Street superhighway's entry to and exit from the loop.

This is the first phase of constructing the substructure, which will go 30 feet below the water surface, and slightly lower than the river bottom. The bridge is called a Siamese twin design because its span for east and west traffic will be separate, and will be raised and lowered independently, although both will be attached to the same foundation. This is to permit the use of one span, while the other is being repaired, so that there will be no traffic interruptions.

There is another unusual feature. At that point the Chicago River flows in a south easterly direction, while the highway route is east and west. To make the bridge conform with the line of the highway, the twin spans will be echeloned. This means that the south span will be built 31 feet farther east than the north span. This permits a substantial reduction in the length of the spans. Each span will be 298 feet long.

Over-all width of the bridge will be 110 feet, with each roadway 43 feet. Each twin span will have two leafs, each weighing 3,515,000 pounds. Each leaf will be raised and lowered on an axle 27 inches in diameter by separate counterweights and electric motors. When raised, the leafs will be at a 77 degree angle.

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W. S. E. Personals

Dr. Gustav Egloff, WSE's 1949-50 president, has been active this past month speaking at conventions and dedications.

Dr. Egloff participated in a panel discussion at the 48th annual meeting of the National Petroleum Association in Atlantic City, N. J. Dr. Egloff discussed "Additives for Military and Civilian Gasoline and other Motor Fuels."

On September 12, Dr. Egloff was the principal speaker at the dedication ceremonies of the Deep Rock Oil Corporation, Cushing, Oklahoma.

Titus G. LeClair, past president and trustee of WSE, is the newly elected president of the American Institute of Electrical Engineers. Mr. LeClair took office on August 1.

Chief Electrical Engineer of the Commonwealth Edison Company, Mr. LeClair has been a member of WSE since 1928.

Harold L. Root, formerly chief estimator for A. J. Boynton & Co., is now with the Estimating Department of Ragnar-Benson Co.

Our members at the Cook County Highway Department are now located at 130 N. Wells St.

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Reviews of Technical Books

Available at WSE Headquarters

Recording

Magnetic Recording, by S. J. Begun, Murray Hill Books, Inc., New York, 1949. 242 pp. $5.00.

In bringing out this book during the still fluid development of magnetic recording, the author has served a useful purpose in summing up the story to date.

Valdemar Poulsen, in the latter part of the 18th century, had developed the science of wire recording to the point of commercial use. Since electronic amplifiers were not developed then—in the early 1900s—earphones were required and the "Telegraphones" were used as dictating machines and telephone recorders.

Financial failures of the manufacturers, due to poor management rather than lack of a market, allowed magnetic recording to pass into oblivion until nearly 1930. After that, considerable progress was made in Europe, and Germany, under Hitler, used this method of recording extensively for broadcast and military purposes. Steel and powdered tapes were used and new alloys were introduced.

Progress in this country leaped ahead during the war since magnetic recording equipment in its portability and lower power requirements was very adaptable to the military needs.

The author, after thoroughly explaining the theories and fundamentals involved, devotes considerable space to existing commercial types and applications of magnetic recorders. The glossary and index add to the usefulness of this interesting and well-written book.

J.A.S., WSE.

Basic Electrical Engineering

Introduction to Electrical Engineering, by George V. Mueller, McGraw-Hill Book Co., New York, 1948. 591 pp. $5.00.

Nearly 130 pages of this book are devoted to a thorough study of basic principles under the chapter headings of Ohm's Law and Kirchhoff's Laws. Interspersed with examples, the explanations are clear and more detailed than usually found in a text of this class.

This second edition was revised to conform to the latest standard definitions, abbreviations and symbols as adopted by the American Institute of Electrical Engineers and the American Standards Association. Instructions and experiments for laboratory work add to its usefulness as a textbook. The author drew from his experience as a professor of Electrical Engineering at Purdue University.

J.A.S., WSE.

Economics and the Engineer

Engineering Economic Analysis, by Clarence E. Bullinger, McGraw-Hill Book Co., Inc.—Second Edition 1950. $4.00.

This book covers the broad range of Economic Analysis. It is intended to serve both as a text book for Engineering students as well as a guide for those who are professionally or commercially engaged in the engineering field. It is designed to aid those who have a need for a better knowledge or for a review of the principles of economic selection.

Broadly speaking the report of an engineer on a proposed project consists of two parts, one the Technical Solution and the other, (covered by this book) the Economic Solution.

Basically the Economic Analysis of an undertaking are covered by three separate yet definitely related analyses; 1st the Economic Analysis which attempts to discover the worth-whileness of the project in terms of yield on the investment; 2nd the intangible analysis which attempts to discover the worth-whileness in terms of those factors which are more difficult to evaluate because the factors of Human Judgment enter into their valuation; and finally the financial analysis dealing with the problem of providing funds with which to make the project possible.

A study of the book indicates that a very logical approach and treatment has been ably employed by the author, along with several improvements over the former edition.

This book should be of value to and satisfy the needs of those seeking training or information in this field.

J.E.K., WSE.

Efficiency Through Layout Planning

Layout Planning Technique, by John R. Immer, McGraw-Hill Book Company, Inc., New York, 1950. 430 pp. $5.00.

This first edition is one of the McGraw-Hill "Industrial Organization and Management Series" which includes approximately forty books already published or in production. It presents the basic principles of production flow and layouts, methods for solving layout problems, examples from many types of manufacturing plants, offices, stores, farm and other applications of layout planning. It is intended to serve the industrial engineer on plant layout but it should be of interest to management and those responsible for production and efficiency.

Subjects discussed include specialization of labor, progressive assembly, sub-assembly, straight line production, jigs and fixtures, balance, flexibility, lines of flow, materials handling, selection of equipment, and other related topics. Some historical examples are recorded but it is generally

Book Reviews

recognized that production studies resulting in radically new and efficient methods of coordinating the work of employes with material movements have largely been the development of comparatively recent years. The automobile industry is an outstanding example as a leader in this movement.

A considerable portion of the material in this book specifically describes and illustrates layouts and methods which have been placed in service in various existing industries most of which are nationally known. References are made to other books and publications and a list of available film illustrating correlated subjects is appended.

In view of the progress made in improving plant layouts and methods which was accentuated during the recent war and has continued in the post-war period, this book is timely and appears to be well capable of meeting the objectives of the author. March 7, 1950.

E.B., WSE.

Mechanical Vibrations

Elements of Mechanical Vibration, by C. R. Freberg and Emory N. Kemler, John Wiley & Sons, Inc., New York, 1949. 227 pp.

In this second edition, a chapter on sound and its engineering applications has been included together with additional emphasis on beams. The book covers a fairly wide range of applications of the theory of mechanical vibrations and is primarily intended for use as an elementary text.

Engineers confronted with the necessity of arriving at reasonable solutions to vibration problems will find this treatise of considerable value, but since calculations may be only relatively accurate, the effectiveness of applications will also be dependent upon use of experience and good judgment. For the comparatively few engineers and scientists proficient in advanced mathematics and theory there remains the difficult field of development of vibration engineering which this book does not explore.

The average engineer will be interested in the description of commercial materials and types of suspensions used to effect vibration absorption and isolation, including metal spring housings and adjustment features, isolators of the sandwich type with rubber in tension or shear, cork, felt and other materials and methods. Many characteristic problems are presented for solution with answers at the ends of chapters. Instruments commonly used are illustrated. The new chapter on sound covers terminology, noise sources, relative intensity, transmission, absorption and similar features. Included in this book, but not ordinarily found in a treatise at this level, is an exposition of the Firestone "mobility analog" and its place in experimental investigation of complicated vibrating systems.

Commercial equipment is increasing so rapidly in speed, power and complexity, that the cut and try methods of vibration control formerly in common use have largely given way to a more theoretical and orderly approach. The range of vibration engineering is so broad and demanding that, like a mirror, it reflects that which you are capable of putting into it.

E.B., WSE.

Gas Turbines and Rockets

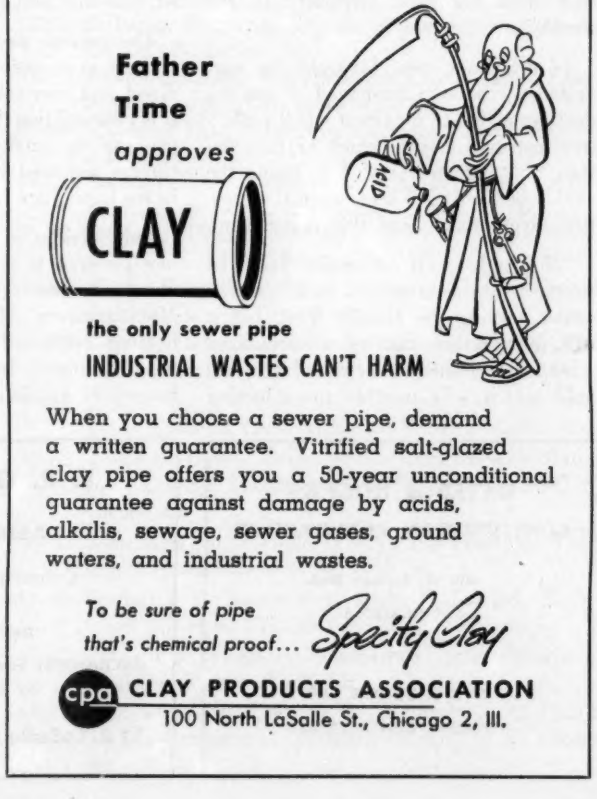
Introduction to Gas-Turbine and Jet-Propulsion Design, by C. A. Norman and R. H. Zimmerman, Harper and Brothers, New York, 1948. 286 pp. $5.00.

This book deals with gas turbines for stationary, aircraft, marine, and locomotive plants, and with rockets. It is intended for use as an elementary textbook and therefore the authors have avoided theoretical complexities that do not contribute to fundamental understanding and intelligent use in design. It follows that the subject matter is of such character that the engineer who is not a specialist can obtain sufficient working knowledge of this timely subject to satisfy and fortify himself in a practical manner.

The book is divided into three parts. The first part deals with fundamental mathematics, approximate gas-turbine analysis, accurate computations, entropy, expansion, compression, and gas chart; the second with combustion chambers, turbines and turbine details, compressors, and materials and general design considerations; and the third with aircraft power plants, stationary, marine, and locomotive plants, and rockets.

There are numerous diagrams and photographs obtained through the courtesy of the manufacturers, together with description matter and historical sketches showing the rapid development in this field which was accentuated by recent war demands and the future of which is presently unfolding.

E.B., WSE.



Design and Industry

(*Continued from Page* 10)

Offer Graduate Work

Last fall, as a result of consultation between the Board of Directors of I.I.T. and the Institute of Design, the latter became formally a department of Illinois Tech. As the result of this merger, Illinois Tech will be unique in having within the framework of an institution of higher learning a degree-granting department in industrial designed and in visual communication design. As a further result of the amalgamation, it is planned to extend this work beyond the undergraduate course of four years into graduate work and advanced research in the field, and I use now the words of Serge Chermayeff's program:

"In this manner, Illinois Tech will develop a well balanced and integrated program in which science, technology and design will play their equally important parts. A unique emphasis is on the development of a training program and research facilities in the field of industrialization of building components and building equipment which at this time does not exist anywhere in the world."

In this bold step, far-sightedly suggested by Serge Chermayeff, I see the decisive action to obtain at last the effective instrument with which to fuse design and industry, and I welcome the choice of Konrad Wachsmann, the creative inventor, to head this department.

"Not only will Illinois Tech be strengthened as a school and research center serving the Middle West, but it will, in addition, become a specialized school in a relatively new and growing field which will provide much-needed facilities for the best professional brains and which already is attracting a large enrollment of students from all over the world. The program will enable Illinois Tech to have a school and research center in which designers, scientists and engineers will act collaboratively with industry.

Three Divisions

The three major sub-divisions of the program will include, in one department, architecture and city planning; and in another, in the Institute of Design: (a) the design of industrially produced building components and equipment and (b) visual aids in communication. The technical services already rendered over many years by the Institute and concentrated to a major extent with production goods will now be extended into the area of consumer goods, and, in particular, those which are essential parts of dwelling.

Within the new coordinated program of work a climate is created in which scientific attitude, technical discipline and aesthetic sensibility can grow. It is an activity which embraces and correlates into a single field the work of artist, scientist and technician.

The various problems will not be examined in isolation but always in their direct and inevitable inter-relationships. It is believed that this aspect of the whole program in particular will produce designers required by American industry in the immediate future.

Subdivisions of industry to which the new program is of immediate interest, to choose a few typical examples, are: Manufacturers of building materials, heating and ventilation equipment, electrical fixtures, furnishings, hardware, household appliances and utensils, textiles, printing, advertising, packaging, photography, cinematography, television, etc."

The men responsible for this great task of integrating the various departments seem to be of the same progressive spirit. Mies van der Rohe who at one time, on my suggestion, had been named my successor as Director of the Bauhaus abroad until it was closed by the Nazis, has headed the Department of Architecture and City Planning of I.I.T. already for 12 years, and work of his genius has become prominently dominant in the Chicago skyline. The stage is set for a fruitful collaboration.

Final success will depend on the skill of the leaders to combine their forces to work as a team, being convinced that the team is greater than any of its individual members. It is *that* spirit, not hero worship, which makes for the climate in which cultural refinement in our democracy will grow. Its influence will be deeper than any isolated individual effort can be, since its products go through the acid test of being checked and rechecked by all participants of the team.

Here originates the true standard product. Standardization is not an impediment to the development of culture but, on the contrary, one of its immediate prerequisites. A standard may be defined as that simplified practical thing in general use which embodies a fusion of the best of its anterior forms—a fusion preceded by the elimination of the merely arbitrary or whimsical and all otherwise ungeneric or non-essential features. The fear that individuality will be crushed out by the growing "tyranny" of standardization is the sort of myth which cannot sustain the briefest examination.

(*Continued on Page* 31)

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WSE Applications

In accordance with the By-laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Junior, Member, Associate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office, 84 E. Randolph St., RA ndolph 6—1736.

564-81 Harry L. Wickstrom, 6506 N. Claremont Ave., attending Illinois Institute of Technology.

565-81 Ellis W. Dorsy, 7045 Osceola Ave.

566-81 Douglas S. Moir, Special Representative, New York Life Insurance Co., 134 S. LaSalle St.

1-82 Robert W. Olesen (Trsf.), Sales Engineer (Trainee), Link-Belt Co., 300 W. Pershing Rd.

2-82 James A. Guske (Trsf.), Development Engineer, Holly Molding Devices, Inc., 6733 South Chicago Avenue.

3-82 Thomas E. King, 5671 S. Normal Blvd., attending Illinois Institute of Technology.

4-82 Warren W. Nygren, R.R. 2, Box 311-A, Chicago Heights, Ill., attending Illinois Institute of Technology.

5-82 Robert H. Pichler, 1027 Lill Ave., attending Illinois Institute of Technology.

6-82 Fredrick W. Rys, Engineer, Freyn Engineering Co., 109 N. Wabash Ave.

7-82 Burdette E. Sanderson, Staff Assist. (Vice Pres. Operations Office), Public Service Company of Northern Illinois, 72 W. Adams St.

8-82 William E. Ryan, Engineer Salesman, The Trane Co., 2326 S. Michigan Ave.

9-82 Jack Hille, Sales Engineer, DuBois Engineering & Manufacturing Co., 6805 McCook Ave., Hammond, Indiana.

10-82 Harry M. Jensen, Engineer, Public Service Company of Northern Illinois, 72 W. Adams St.

11-82 Norbert J. Sladek, 2346 S. Highland Ave., Berwyn, Ill., attending Illinois Institute of Technology.

12-82 Thomas G. Ayers, Manager of Industrial Relations, Public Service Company of Northern Illinois, 72 W. Adams St.

13-82 Richard Carthcart, Project Engineer, Askania Regulator Company, 240 E. Ontario St.

14-82 John H. Duescher, Mechanical Engineer, Askania Regulator Company, 241 E. Ontario St.

15-82 Chester C. Rice, Gas System Design, Public Service Company of Northern Illinois, 1001 S. Taylor, Oak Park, Ill.

16-82 Leslie L. Bauer, Structural Engineer, Alfred Benesch & Associates, 30 E. Adams St.

17-82 Embert H. Almcrantz, Industrial Engineer, Electrical Windings, Inc., 2015 N. Kolmar Ave.

18-82 Roger S. Fabri, Industrial Appraiser & Engineer, Coats & Burchard Co., 4415 N. Ravenswood Ave.

19-82 Charles W. Mayer (Trsf.), Junior Engineer, E. W. Andresen Corp., 6650 N. Hamlin Ave.

20-82 Conrad Th. Wieler, Designer, Verson Allsteel Press Co., 1355 E. 93rd St.

21-82 John J. Scopelite, (Trsf.), 9323 S. Ridgeland Ave.

22-82 Robert C. Meissner, Vice President, John F. Meissner Engineers, Inc., 308 W. Washington St.

23-82 Robert S. Hammond, Vice President, Whiting Corporation, 33 S. Clark St.

24-82 Robert A. Weiss, Civil Engineer, Swift and Co., Union Stock Yards.

25-82 Philip L. Coleman, Partner, Duff and Phelps, 208 S. LaSalle St.

26-82 Anthony N. Cota, 6007 S. Winchester Ave.

27-82 T. C. Matzner, Senior Equipment Inspector, Commonwealth Edison Co., 72 W. Adams St.

28-82 Martin E. Unger, General Foreman-Lands. Constr., Chicago Park District, 425 E. 14th Blvd.

29-82 Roland H. Olson, Training, Bert Exelrod, 608 S. Dearborn St.

30-82 Howard W. Frazer, District Engineer, Infilco, Inc., 325 W. 25th Pl.

31-82 Parker J. Montague, Owner, Montague Construction Co., 228 N. LaSalle St.

32-82 Joseph Corfield, Superintendent, Lake States Engineering Corp., 53 W. Jackson Blvd.

33-82 J. George Thon, Hydraulic Engineer, Pioneer Service & Engineering Co., 231 S. LaSalle St.

34-82 Anthony Flan, President & Chief Engineer, Oakton Engineering Corp., 725 Oakton, Evanston, Ill.

35-82 Harold J. Thompson, Sales Engineer, National Acme Co., 170 E. 131st, Cleveland, O.

36-82 E. A. Schmidt, District Manager, I-T-E Circuit Breaker Co., 105 W. Adams St.

37-82 John G. Duba, Instructor in Civil Engineering, Illinois Institute of Technology, 3300 S. Federal St.

38-82 Joseph W. Mullaney, Jr., Concrete Engineer, DeLeuw, Cather & Co., 106 Mercer St., Highstown, N. J.

39-82 Theodore DeWitt Talmage, Assistant Division Manager, Kellogg Switchboard & Supply Co., 6650 S. Cicero Av.

40-82 John MacLennan (Rein.), Structural Engineer, Visking Corporation, 6733 W. 65th St.

41-82 Frederick E. Toensmeier, District Manager, Rockwood Sprinkler Co., 3610 S. Morgan St.

42-82 Frank Rue, Engineer, Mississippi Valley Structural Steel Co., Melrose Park, Ill.

43-82 Fred W. Boetel, Engineer Tax Representative, Public Service Company of Northern Illinois, 72 W. Adams St.

Structural Aspects of Power Plant Design

(*Continued from Page* 12)

distributed according to the relative stiffnesses of the columns. The vertical wind loads should be established by the cantilever method.

The wind moment connections should be designed for the sum of wind moments in the girder plus the negative moment of the gravity loads due to the restraint of the connection. This should be done even if the girder is designed as simply supported for the gravity loads.

Several parts of the superstructure require special attention. Some of these are analyzed briefly here.

Suspension Boilers

Some modern boilers have very large dimensions. A boiler of 500,000 lbs. per hour capacity approaches the height of a skyscraper. Such a boiler may weigh several million pounds. Many boilers are supported by suspension, which introduces new and difficult problems in providing adequate girders and columns. When heavy boiler supporting girders frame into the flanges of columns, the subsequent column moments due to the eccentricity cannot be ignored.

In order to lift up and move the stator of turbo-generators, moving cranes up to 200 tons capacity are required in the turbine rooms.

The rail supporting girders have to be designed for maximum moments, shears, impact, and longitudinal and transverse acceleration of the trolley.

The crane columns carry the crane girders and also the roof over the turbine room. Heavy girders are seldom supported on brackets, but rather on stepped-up, or double columns.

The analysis of stepped-up columns is most conveniently carried out by the use of the column analogy.

Large capacity boilers require large coal bunkers. It is not unusual to have bunkers in units up to 1,500 tons capacity.

There is little in the recent technical literature concerning the design of coal bunkers. Consequently, each designer follows his own system, often resulting in extremely conservative design.

This writer believes that deep (50′ to 70′) bunkers should be analyzed on the deep bin theory basis. The bunker plates should be analyzed as flexible plates, and the stiffeners and plates considered jointly to take combined bending and tension.

Skyscraper Smokestacks

The majority of smokestacks are self-supporting steel plate, usually with 2½″ to 3″ gunite lining. Such stacks may be as high as 200 feet, with diameters up to 20 feet.

The bottom of the stack is often flared for added stability; or sometimes, the whole stack is tapered, providing a very pleasing appearance.

Such stacks are supported on the roof structure, which has to be very rigid. Specifications usually limit the permissible deflection at the top of the stack to a total amplitude of a few inches.

In order to calculate the maximum deflection at the top of the stack, the resultant deflection due to the following forces and effects have to be considered:

1. Flexure of stack due to wind loads.
2. Flexure of supporting beams and girders.
3. Shear deformation of supporting girders.
4. Elongation of anchor bolts.

Smokestacks should also be analyzed for aerodynamical effect. There have been at least two known cases when one of the smokestacks in a group underwent violent vibrations and produced

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Structural Aspects of Power Plant Design

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deflections ten times the permissible. Such disturbances always occurred at rather low wind velocities, and the deflections were always perpendicular to the wind direction.

Such disturbances are produced by unbalanced, staggered eddy formations (Karman Vortices) and a definite relationship exists between the period of such eddies and the natural frequency of vibration of the stack.

The best guarantee against such disturbances lies in spacing the stacks either below or beyond the resonance limit, which is about 4½ to 5½ times the diameter of the stack.

Obviously, the stiffer the supporting roof structure, the stronger the dampening effect on the deflections.

The number of structures of lesser importance is too large to enumerate individually. Nevertheless, such structures as water tanks, water treatment plants, substations, transmission towers, etc., have to receive the designer's special attention.

A large design office is usually divided into squads of 6 to 12 men, consisting of a leader, one or two designers, checkers, senior and junior draftsmen. A project engineer sometimes is placed over the squad, who coordinates the different trades, takes care of the correspondence, makes the necessary personal contacts, and assumes final responsibility for the design.

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Design and Industry

(*Continued from Page* 28)

In all great epochs of history the existence of standards—that is, the conscious adoption of type-forms—has been the criterion of a polite and well ordered society; for it is a commonplace that repetition of the same things for the same purposes exercises a settling and civilizing influence on men's minds. But mere machine repetition certainly does not by itself create a standard. For rationalization, which many people imagine to be the cardinal principle of present design, is really only its purifying agency.

The other principle, the aesthetic satisfaction of the human soul, is just as important as the material. If mechanization were an end in itself, it would be an unmitigated calamity, robbing life of half its fullness and variety by stunting men and women into sub-human, robot-like automatons. But in the last resort mechanization can have only one object: to abolish the individual's physical toil of providing himself with the necessities of existence in order that hand and brain may be set free for some higher order of activity.

When I was honored with being asked to address you tonight I felt that I should put more emphasis on the cultural aspect of my speech than on the vocational. Summarizing my arguments I should like to state that the predominant educational task is to call forth creative habits. Vocational skill should be a by-product only as a matter of course. The students mind will become increasingly inventive when he is guided through sensorial as well as intellectual experiences. A program of search rather than of re-search makes the creative designer. This attitude will lead him from observation to discovery and finally to intuition.

I do not know of any design institute in the world which is better fitted to provide such education than the 'Institute' here in Chicago.

This speech is a plea addressed to the American industry to accept and support the new service offered them. The new framework obviously needs also financial help for buildings and tools to be fully efficient. But this is not only a request for material help, but a suggestion that industry should participate actively in a mutual give and take, recognizing that here is an organically developing opportunity to achieve further refinement for their products which may bring them increasing cultural predominance on the world market.

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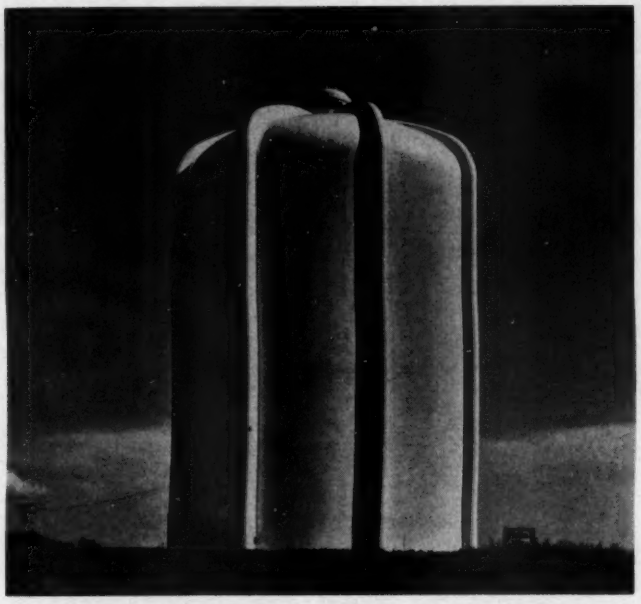
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BACTERIOLOGIST Doctorate grad. training in dairy manufacturing or food technology. Will work in research lab. for a foods manufacturer. $350-$500. Chicago R6851(c).

3,000,000 GALLON STEEL STANDPIPE



The City of Madison, Wisconsin, recently installed the 3,000,000-gal. welded steel standpipe, shown at the left, in its water distribution system. The tank is 73 ft. in diam., 100 ft. to the high water line, and has eight semi-cylindrical pilasters welded to the outside of the shell at equi-distant points and extending up over the self-supporting ellipsoidal roof to an ornamental cupola at the top.

The water distribution system in Madison consists of 2 mi. of transmission mains from 8 to 30 in. diam. and 240 mi. of 3 to 30 in. diam. distribution mains. It serves approximately 20,000 customers, over 95 per cent of which are domestic users, and 2,000 fire hydrants. Total consumption ranges from 10 to 18 mgd. and averages 12 mgd. The City of Madison obtains its water supply from 12 deep wells.

Write our nearest office for complete information or quotations on steel reservoirs or elevated steel tanks.

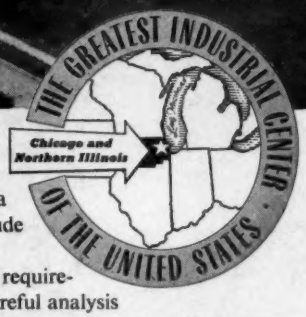
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A letter describing your requirements will bring you a careful analysis of this area's advantages as they apply to *your* business. Or if you wish, we will send you a carefully screened list of the available buildings or sites that would be suitable for your business, based on the information you give us.

Just write us. We of course keep all such inquiries confidential.

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